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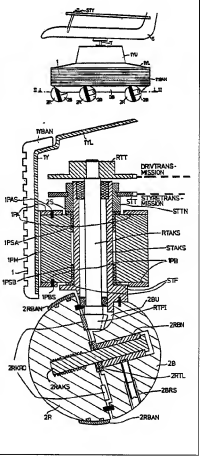
(57) Abstract

A chassis, particularly for carrying a wheelchair with pivotal seat (S), fitted with ground-engaging wheels with at least one driven from a drive device through a drive transmission and with at least one steerably suspended and connected to a steering motor receiving steering signals for steering the chassis bearing while driving from a steering panel comprising steering control devices (STY) is described, whereby all steerably wheels (2R) are drive device driven and steerably suspended each being pivotal about a vertical steering axis (2S, STF) geometrically maintained within or at a vertical plane comprising the wheel axis (2RAKS). By means of a between the steering axes (2S) arranged and these mechanically connecting steering transmission system (STT) including a herethrough for the pivoting of said steering axes (2S, STF) connected steering driving device rotating the axes, and through the same direction of rotation, each steering axis (2S, STF) is arranged able to pivot all said wheels about their steering axes (2S, STAKS, STF), i.e. through mainly equally sized pivoting angles independently of the bearing of the seat or dependently being correlated therewith. A drive device can directly or through a drive transmission system (RTT, RTAKS) with the same direction of rotation simultaneously rotate all wheels (2R). A steering system hereto, mainly of electronic kind, is described.



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WHEELED CHASSIS AND STEERING DEVICE FOR STEERING IT.

The present invention relates to a wheeled chassis including a drive device for driving the wheels, and which wheeled chassis may serve as chassis for a wheelchair or as a wheeled chassis for the transporting of some other object, the wheeled chassis having at least one of the wheels driven by the drive device through an intermediary drive transmission, and whereby at least one of the wheels for the steering of the driving course of the chassis is mounted to the chassis through a steerable support being steerable by means of at least one, to the steerable support connected, steering motor which steering motor receives steering signals from a steering panel with steering control devices, and whereby the wheeled chassis further comprises support means adapted to support a chair or other holding means adapted for the fixation and holding of the said objects to be transported.

Generally, most wheelchairs of prior art technique, which are employed for transporting of invalid persons or of weaker or ill persons being unable to walk themselves, are made in conformity with the above described technique of prior art, i.e. they comprise a chassis, generally a frame shaped chassis, which through suitably suspended wheels, the suspension means thereby comprising suitable spring means and being of per se known kind, carries four ground-engaging wheels of suitable sizes, of which wheels two may be fitted to the chassis with one on each of two opposite sides of the chassis the wheels being carried through a common in cross direction arranged wheel axle or through two separate wheel axles, which are arranged sharing a common geometric axis, and whereby the further two of the ground-engaging wheels are steerably suspended in that their steering axes are vertically oriented, and in that in general two of these ground-engaging wheels are

connected to a wheel drive means and being made steerable as described above as from a steering control panel situated as suitable within easy reach of the person being transported by the wheel chair.

At such an arrangement of the ground-engaging wheels they in general are arranged as in case of a common rear-wheel-driven automobile, though the suspension structures for the wheels do have a more simple structural shape, because they only are going to be operated at fairly low drive speeds. On the other hand, the steering wheels are suspended in such a manner so that geometrically the vertical steering axis is located in front of the wheel axles whereby in per se well known manner a self correcting straight forward driving can be maintained.

This usually employed kind of structure for a wheelchair suffers under more than one drawback. Such a wheelchair can not be described as being particularly steerable, and in case of more complicated steering manoeuvres as for steering to achieve a close passing of larger objects, furnitures, etc., in narrow environments require the use of reversing manoeuvres to bring the rear wheels to follow a correct track. A sideward directed driving of the wheel chair is not attainable in a fairly easy manner except to bring about more small to-and-fro movements by the wheelchair, and thus only a kind of sideward zig-zag-driving may be the only sideward movement which in a somewhat awkward manner may be made attainable.

Moreover, an oblique direction of approach while driving close to a table is only possible, whenever to-and-fro-drivings are not wanted to be carried out, in the manner that the wheelchair, including the seat of it, are brought to attain an oblique oriented position as in relation to the edge of the table. It is thus easily understood that a person being seated in the chair also simultaneously in position has to be turned similarly

oblique in relation to this same edge of the table. When a person being seated in the chair thus has to be brought to bed or has to be brought into the seat from a bed this is only possible when the front of the wheelchair is oriented so that it is turned straight forward towards or oblique towards the side or longitudinal edge of the bed, in such a situation rather much additional labour is required from an aiding person, as well when a person has to be passed from the wheelchair to the bed as when the person has to be moved in the opposite direction.

Through the present invention it is the purpose to provide a wheeled chassis and an arrangement of the ground-engaging wheels for a wheelchair of the initially mentioned kind, whereby the required drive means and steering means both are of fairly simple structure, and whereby the mentioned well known drawbacks are being avoided, i.e. to a first approximation that the wheelchair is made able to move as well sidewards as omnidirectionally, i.e. in any direction running oblique to a presently existing direction of movement.

This is according to the present invention by a wheeled chassis of the initially mentioned kind attained in that all steerable wheels also are by means of the drive device driven ground-engaging wheels, whereby these, thus driven ground-engaging wheels are mounted steerably suspended each being pivotal about a vertical steering axis geometrically maintained within or in the near vicinity of a vertical plane comprising the respective wheel axis, and in that by means of a between the steering axes arranged and these mechanically connecting steering transmission system including a, through this steering transmission system, for the pivoting of these said steering axes connected steering driving device simultaneously and through the same direction of rotation each steering axis is arranged able to pivot all these driven

ground-engaging wheels about their steering axes, i.e. through approximately mainly equally sized pivoting angles, and in that a with the driven ground-engaging wheels directly connected, or through a drive transmission system connected, drive device simultaneously through equal units of time in the same direction of rotation rotates all these driven ground-engaging wheels with mainly equally sized angles of rotation about their wheel axes.

Herethrough, by means of a wheelchair thus shaped according to the invention the aforementioned purposes are being attained; but, also further advantages are achievable as to be described as follows.

By means of the invention all suspensions for the ground-engaging wheels may be shaped alike, and a compact structure of the chassis is providable, and furthermore, the wheeled chassis itself may be rotational symmetrical structured comprising mainly equally shaped structural segments to be comprised within such a rotational symmetrical structure.

This is to be provided when the ground-engaging wheels, in particular according to the invention, are arranged equally spaced along the periphery of a horizontally circularly shaped or regularly shaped wheeled chassis, when in the vicinity of the periphery and along this the ground-engaging wheels are being suspended mainly equally spaced.

A to this purpose in particular suitable ground-engaging wheel arrangement by which the individual wheels only occupies a small space is according to the invention characterized in that the steering axis comprises two coaxially arranged axes or shafts of which the coaxially innermost at the lower end terminates in a toothwheel, in particular a conically shaped toothwheel of a bevelgear, engaging into an as corresponding conically tootwheel shaped and/or into a with engaging teeth provided ground-

engaging wheel whereby the wheel axis hereof geometrically together with the ground form an angle of a size deviating from zero degree and preferably is laying between 10 and 30 degrees, and whereby the wheel axis is bearing suspended in a bearing block being in a fixed manner connected with the coaxially outermost of the steering axes, and whereby the upper end of the two coaxially steering axes or shafts respectively are connected with the drive transmission system and with the steering transmission system which respectively provide drive connections with on the one hand the driving drive device and on the other hand the steering drive device, and whereby each individual ground-engaging wheel and each individual bearing block preferably both can be semi-spherically shaped and arranged with their flat surfaces facing each other, and whereby between them for the keeping-away of dust and/or dirt an annular sealing means is provided inserted between such two semi-spherically shaped bodies.

The ground-engaging wheels may in per se known manner be provided with a sufficiently safe non-sliding tread which can be of hard rubber.

To safeguard that the individual ground-engaging wheels in case of driving on uneven ground excerts somewhat the same wheel pressure against the ground, the steering axes of the ground-engaging wheels can according to the invention all be arranged suspended in an elastomeric, in particular a springlike elastomeric, plate member and/or in more of such kind which thus interconnect the bearings for said steering axes.

By means of such kind of bearing arrangement it is in general achieved that the individual steering axis or shaft during movements forceing a spring effect into action to a large extend remain mutually parallel oriented.

To achieve that the centre of gravity of the structure is brought to lay low in the structure and that an

easy access is provided to batteries, electric devices, namely such as charging device for batteries, as well as electric and electronic equipment, namely such as electronic steering panels, contactors and other switching members, it is according to the invention preferred that such members are arranged as being mounted on a plateshaped bootom element which has a diameter being of approximately the same size as the diameter, or a little less than this, between opposite positioned ground-engaging wheels mounted on the wheeled chassis, and that the bottom plate element in radial direction at the periphery is arranged to have a slanting upwards running peripheral rim, and that the bottom plate element easy-to-fasten by means of easy accessible holding members of per se known kind, such as screws, snaplock-devices, tunged locking mechanisms, etc., is kept in place on the wheeled chassis.

To avoid any producing of scratching of foreign objects while driving the wheelchair the upper portion of the wheeled chassis may be covered by means of at least one single element shaped as a broad annular top cover having a peripheral portion which is cylindrically shaped and downwards terminates in a skirt shaped portion having the external surface thereof arranged as or being comprised as a broad belt or girdle exhibiting suitable elastomeric properties against blows or strokes from external objects, being of a material such as soft rubber or any other kind of elastomeric plastic material, and whereby the top cover by means of suitable fastening or holding means of any per se known kind, such as screws, snaplocking mechanisms, tounged locking mechanisms, etc., in an easy-to-dismantle manner is kept in position on the wheeled chassis.

According to the invention it is advantageous to arrange preferably at least two simple, rigid and radially oriented connecting struts which provide a mechanically

rigid connection between a centrally supporting member, which serves to support a wheelchair seat or serves to support any other object to be transported by means of the wheeled chassis, and at least one of the aforementioned peripheral elastomeric plate elements which belong to the wheeled chassis, and whereby these connecting struts comprise fastening means or fastening apertures for the fastening of at least one, preferably for the fastening of two vertically spaced arranged, device-supporting plate member(s) arranged to support the driving and steering drive means, and whereby preferably between these two said drive means drive and steering transmissions are arranged, thus connecting the driving and steering drive devices and the suspensions for the ground-engaging wheels.

Suitable transmission elements may be provided each as a common for all suspensions of the ground-engaging wheels arranged between these suspensions running tooth belt or chain element, which also has to be connected with the respective drive and steering drive device, and which devices for the two operational functions to be carried out preferably are arranged to be common for all the ground-engaging wheels, and thus including at least one per se known tightening element for the tightholding of these elements.

To achieve that the, in particular at the initial moving and at stopping of the drive movement of the wheelchair between this and the ground below as unavoidable, generated back-lash is kept as low as possible and to achieve that this by a person seated in the wheelchair is sensed as only being of one simple kind, e.g. sensed as only being some simple drive back-lash caused by parts belonging to transmissions or to ground-engaging wheels, it is according to the invention advantageous that a vertical arranged bushing bearing able to serve as bearing for a vertical stem, shaft or journal belonging to a by

means of a further drive device pivotal arranged seat or fastening or holding member for any other said object to be transported by the wheeled chassis, apart from a further comprised drive transmission providing drive connection hereto, is provided with a, preferably adjustable, intermediary frictional element arranged between the bushing bearing and the said stem, shaft or journal, whereby this frictional element possibly can be provided as a from the outside adjustable, suitable elastomeric screw means made as of nylon material or other plastic material or elastomeric material.

Embodiments according to the invention are described in further details as follows under reference to the drawing in which:

Fig. 1 shows seen from the outside in sideview an embodiment according to the invention of a wheeled chassis,

fig. 2 shows cross section II-II according to fig. 1,

fig. 3 shows in the perspective the supporting portion of an embodiment of a wheeled chassis according to the invention whereby all exterior cover plates and the bottom plate including carried drive devices shown in fig. 2 are cut away,

fig. 4 shows seen from the top the embodiment according to fig. 3 of a wheeled chassis according to the invention whereby the arrangement of drive devices and an embodiment for drive transmissions hereto are shown,

fig. 5 shows a little different embodiment of the wheeled chassis which is shown in fig. 4,

fig. 6 shows vertical cross section through a ground-engaging wheel being embodied according to the invention including an embodiment of one of two coaxially arranged axes or shafts carrying

the ground-engaging wheel including bearing and drive transmission for a steering axis or journal,

fig. 7 shows vertical cross section through a carrying bushing bearing including drive transmission for an in part as cut away shown carrying stem, shaft or journal for the supporting of a wheelchair seat or for the supporting of any other object to be transported by the wheeled chassis,

fig. 8 shows an in general well known embodiment of an angle encoder being able to output sine and cosine values of the angle,

fig. 9 shows schematically an according to the invention embodied wheeled chassis fitted with a seat and with steering control panels arranged on the armrest,

fig. 9A and 9B show in more details as seen from above the two steering panels shown in fig. 9,

fig.10 shows the embodiment of a steering circuit and

fig.11 shows the arrangement of angle encoders.

Within the drawing elements being alike or elements serving the same functional purpose are marked with the same sign of reference. When within Fig.s in the drawing two elements are either closely related or, as viewed, are positioned behind each other their signs of reference are shown separated by a comma, and the written sequence thus being brought to correlate with their viewing distances.

An embodiment of a wheeled chassis according to the invention is shown in Fig.1 as viewed from the outside in sideview, the shown wheeled chassis 1 is fitted with ground-engaging wheels 2R each being carried by a bearing block 2B which bearing block is pivotally mounted to the chassis as to be pivotal about a vertical steering axis, these mounting elements are not shown visible in fig.1, on

the other hand, the wheeled chassis carries on top a supporting stem, shaft or journal T which in the drawing is shown pivotally holding a schematically illustrated seat S which comprises arm rests able to be swung outwards as well as downwards thus enabling a person to pass into and out from the seat S not alone frontwards, but also sidewards. On the armrest at a suitable place a steering control panel STY is mounted comprising a "joystick" to be used for steering control when the wheeled chassis is driving as well as it also comprises push buttons, etc., arranged as required for manoeuvring attached and/or other electric circuits which may serve other purposes than just the driving. Externally, the wheeled chassis 1 is surrounded by a suitable belt or girdle able to catch strokes or blows while driving when passing close to foreign objects in the environment, and which belt or girdle, e.g., may be made of suitable soft rubber. The upper portion of the wheeled chassis 1 is covered by suitable detachable covers 1YL and 1YU.

Fig.2 shows viewed from above a horizontal cross section along the line II - II in Fig.1 thereby showing elements arranged on a bottom plate member 3B which forms the bottom portion of the wheeled chassis. The bottom plate member 3B is provided with suitable apertures in which the ground-engaging wheels 2R,2B are mounted. Centrally, the bottom plate member 3B is provided with a suitably held and possible through in vertical direction operating spring means suspended device SIG comprising a suitable plurality of electric contact means serving electrically to abut against corresponding electric means mounted on the said stem, shaft or journal T serving to pass control currents and steering signals between required electric drive means situated in the wheeled chassis and the steering control panel STY positioned by way of example on the armrest. As an alernative, when in

stead touch-free electric transmissions means are employed, it is possible to provide a suitable selection of light-emitting-diodes and photo-transistors operating together with hereto belonging steering control electronic circuits and thus provide a touchfree signal transmission between the panel STY and the drive means which are arranged in the wheeled chassis 1.

Such an electro-optical transmission may be provided to take place sidewards or in axial direction unto and from the lower end of the stem, shaft or journal T which to this purpose totally or only along a portion of the length of it is tube shaped.

To achieve a low position for the centre of gravity of the wheeled chassis the rather heavy drive batteries BATT, of which six such are shown, are positioned on the bottom plate member 3B serving in the wheeled chassis to energize the various drive motors and being positioned together with a suitable not shown charge device LADE which when charging the batteries BATT is connected to a mains supply outlet through a suitable removable electric wire. In the drawing ELEK indicates a space to be occupied by the required electronic steering control units and circuit elements. The ground-engaging wheels are arranged mutually equally spaced along the periphery and are arranged equally spaced from the centre of the wheeled chassis. At the shown embodiment the angle mutually formed geometrically in between the radii running from this centre to the indiviual ground-engaging wheels is shown as 2V in Fig.2 and at the shown embodiment will have a size which in practice closely corresponds to 72 degrees.

In the perspective in Fig.3 of the drawing a wheeled chassis 1 is shown with the cover plates 1Y and 1L as well as the external belt or girdle 1BAN being shown removed, whereby also the bottom plate members illustrated in Fig.2 have been removed, and places where to possibly position

the three drive devices MT, MR and MS are only schematically indicated. The stem, shaft or journal T, by way of example serving to carry a seat, is also only schematically indicated in Fig.3.

The in Fig. 3 illustrated embodiment is provided with five connecting main struts 1A connecting a bushing or bearing means 5 for the stem, shaft or journal T and a peripherally arranged annularly shaped member carrying bearing members for the steering axes 2S which through bearing blocks 2B, whereby one bearing block 2B is arranged at each wheel, carry the individual ground-engaging wheels 2R. The ground-engaging wheels 2R can as indicated through the invention be shaped as any plate shaped, rollar shaped or cylindric shaped per se known wheel or the wheels may as an according to the invention advantageous embodiment be shaped as semi-spherically shaped wheels.

The individual wheel suspensions may in per se known manner comprise spring means. According to the invention a common spring means may be provided for all the ground-engaging wheels 2R being shown and through this kind of spring means it is achieved that the individual steering axes of the ground-engaging wheels mutually mainly only are able to perform dislocating spring tensioned movements in vertical direction. Herethrough, movements which result in the occurrence of mutually slanting orientations between the ground-engaging wheels thus can not occur. This is advantageous because any occurrence of such slanting providing or oblique positions providing movements of the steering axes of the ground-engaging wheels do result in a wry-steering of the seat during the driving of the wheeled chassis. Such wry-steering is avoided by means of the invention when, as illustrated, preferably at least two mutually in parallel positioned plate and ring shaped elements 1PA and 1PB are peripherally arranged as annularly shaped members in the wheeled chassis. When five

wheeled chassis. When five connecting struts 1A are provided, and if the number of ground-engaging wheels 2R, 2B corresponds to a multiple of five, in practice a fully only vertical upwards and downwards movability of the steering axes 2S of the ground-engaging wheels has been achieved when spring tensioned movements of the axes take place due to an excentric load influence being exerted on the seat which is mounted by means of the stem, shaft or journal T or due to the ground-engaging wheels 2R,2B are driving on an uneven ground. On the other hand, a good result may in practice be attained, i.e. a sufficiently precise mainly vertical only upwards and downwards movability of the steering axes 2S of the ground-engaging wheels when spring-tensioned movements take place is attained, also when only three connecting struts 1A are mounted and by way of example five ground-engaging wheels 2R,2B are provided. Such an embodiment is illustrated in the Fig.s 4 and 5 of the drawing whereby only three connecting struts are provided resulting in a more simple assembling when the wheeled chassis comprises three drive devices MT, MR and MS being able to be mounted on a plate shaped element 4 which in practice is comprised of three plate shaped elements, i.e. with such an element for each of the three drive units MT, MR and MS whereby each of these plate shaped elements comprises two horizontal, vertically spaced, plate members 4MA and 4MB. On the upper of these members one of the drive units MT, MR or MS is mounted with the corresponding drive shaft being vertically oriented and engaging into a transmission gear, whereby this gear unit may be mounted alone or possibly together with one or more discrete drive means or members in between two such horizontal plate members 4MA and 4MB. As it is shown in the Fig.s 4 and 5 of the drawing, the complete assembled structure may simplified, but also as viewed from a manufactural point of view as advantageous,

be ragarded as a peripherally hexagonal shaped structure.

Serving as outputs of the three transmission gears sprockets MTT, MRT and MST are arranged, thereby possibly also including chain tight-holding members of per se known kind, engaging a chain for each referred to with MTK, MRK and MSK which are connected with sprockets respectively arranged at the lower end of the bushing or bearing means 5 for the stem, shaft or journal T for carrying the seat, respectively are arranged at the top of the individual steering axes 2S thus serving to provide rotation of the ground-engaging wheels 2R, and respectively are arranged below the top of the individual steering axes 2S thus serving to provide the orientational steering of the ground-engaging wheels 2R. An embodiment hereof according to the invention is described in further details as follows.

It is to be remarked that though in Fig.s 3 and 4 a circular shaped embodiment of the plate shaped peripherally arranged annularly shaped spring members 1PA and 1PB is illustrated nothing prevents the employing of other shapes. In Fig. 5 a pentagonal shaped embodiment with inwards curving side portions thereof is shown. A strong inwards curving may in practice be employed. This shape may be advatageous in that more floor space is attained for a supporting persons feet. Alternatively in such case, that it becomes possible to drive closer to or while passing closer to objects in the environments, etc.

In Fig. 6 of the drawing a vertical cross section through a ground-engaging wheel arrangement 2R, 2B and the steering axis 2S including the bearing arrangement for the steering axis 2S as well through transmission sprockets RTT and STT arranged on the steering axis 2S. The ground-engaging wheels are arranged just inside the external cover 1Y of the wheeled chassis 1 the cover 1Y carrying an external belt or girdle 1Y and through the upper cover 1YL is stretching towards the stem, shaft or journal T.

Internally the cover 1Y suitably elastically can be held in place at some suitable positions, e.g. by means of springs, to the elasticity providing set of peripherally arranged annularly shaped plate members 1PA and 1PB. Corresponding hereto an open space is illustrated in Fig. 6 at 1Y between 1Y and the cross sectionally illustrated peripherally arranged annularly shaped plate members 1PA and 1PB, a suitable block shaped member 1PM is illustrated between these for the purpose of connecting them with the steering axes 2S, whereby the block shaped member 1PM is provided with a through-opening comprising a lining set consisting of bearing bushings 1PSA and 1PSB made of a suitable low friction providing material, such as nylon, etc., serving as bearing for the steering axis 2S. The block shaped member 1PM is by means of suitable holding means, such as pin means 1PAS and 1PBS, kept in place unto the peripherally arranged annularly shaped plate members 1PA and 1PB.

The steering axis 2S is prevented from performing movements upwards and downwards in the bearing by means of projections arranged at the sprocket STT and at a lower axis foot portion STF. The steering axis comprises two coaxially arranged axes or shafts, i.e. an external tube shaped axis or shaft STAKS serving to connect STT and STF and an internal driving axis or shaft RTAKS connecting the upper sprocket RTT and a lower bevel gear toothwheel RTPI, whereby the axis RTAKS is held in place by suitable in the drawing depicted bearing bushings positioned within the tube shaped axis or shaft STAKS. The bevel gear toothwheel RTPI is engaging with another bevel gear toothwheel or with a suitable in circular formation arranged set of teeth 2RKRO being positioned on the plane surface of a semi-spherically shaped ground-engaging wheel 2R which can be made of a suitable rigid material by casting or by being turned out the material, the wheel here being

contemplated as made of glass fibre reinforced plastic material and carrying a friction providing tred 2RBAN as well as a central journal 2RAKS of which the other end is button shaped, and whereby the thinner portion of the journal is sitting in a bearing bushing 2RBN which bushing is able to be stuck into a suitable bore or other aperture centrally in the wheel bearing block member 2B and be held in place in this block member by means of a screwed-in set screwlike screw 2BRS whereby this screw is made to project into a peripherally arranged notch on the bearing bushing 2RBN. A pressure or ball bearing 2RTL serves to keep the ground-engaging wheel spaced from the bearing block member 2B. A suitable annularly shaped sealing member, which only is indicated in the drawing, is arranged in the spacing between the wheel 2R and the block member 2B to provided a sealing against dirt, frayed or fibrous material, etc. being caught in the spacing. At the top of the block shaped member 2B a depression is arranged to provide ample space for the bevel gear wheel RTPI. By means of assembling members 2ST which do not have to described in further detail and/or by means of gluing and/or by means of welding the block shaped bearing member is rigidly fastened to the steering axis foot portion STF.

By means of drive chains referred to in the drawing by DRIVE TRANSMISSION respectively by STEERING TRANSMISSION the ground-engaging wheel 2R is brought to rotate in one or the other direction around the journal 2RAKS respectively that the orientation, i.e. the bearing, of the ground-engaging wheel 2R is steered by means of turning the the tube shaped axis or shaft STAKS.

In Fig. 6 of the drawing it is indicated that the sprocket STT comprises a rim of teeth being in a not in further details described manner arranged around a carrying hub. This hub is advantageously held releasably in position, i.e. the hub of sprocket STT may consist of

two from above respectively from below through tensional means against the rim of teeth tensioned annularly shaped members or a suitable set of set screws or any other known means may be arranged for providing a releasable fixation of the hub, so that, in that the mutual mechanical relation between the rim of teeth and the ground-engaging wheels thus is made adjustable, it is easy to acquire that all ground-engaging wheels mutually are made to run parallel oriented, and herethrough it is also easy through readjustment to reestablish this condition in case of possible exchanges of chains including the case when hereby a somewhat different length of the chain links possibly might be introduced. It has to be remarked that it on the other hand is unavoidable that the steering will have to suffer due to some backlash which always is present when chains are used as transmission elements, etc.

In Fig. 7 of the drawing according to the invention an embodiment of a bearing bushing for the stem, shaft or journal T is illustrated. Through this embodiment it is the aim to attain that a usual expected force, which is being exerted against the seat in relation to the wheeled chassis, herethrough should not introduce any backlash movements between the stem, shaft or journal T and the wheeled chassis, just as abovementioned.

The stem, shaft or journal T is provided with a lower portion of it having a smaller diameter than the upper portion of it and being brough to abut against a bushing member 5KY provided internally with conical shape which is resting abutting against an internal upwards projecting conical portion 5KI whereby the conical portion is slotted as indicated through an omitted hatching in the drawing of the left part of this conical portion. Furthermore, bearing bushings 5L serve to secure a proper bearing of the carrying stem, shaft or journal T. When the upper

conical portion 5KY through tensioning of screw 5IH is being pressed downwards the internal conical portion 5KI is brought to sqeeze the thinner portion of the carrying stem, shaft or journal T so that this just is able to be moved up and down.

The thinner lower portion of the carrying stem, shaft or journal T is provided with a peripheral notch TNG into which a cross pin 5NT is projecting while being seated in a cross aperture in the portion of the conical member 5KI being situated below the tube shaped axis or shaft 5AKS.

When powered from the driving motor MD through the rotation providing transmision this tube shaped axis or shaft thus is being turned through the sprocket 5TT, which for instance by means of a cross pin 5TTA is being fixedly secured to this axis or shaft, the stem, shaft or journal T is brought to rotate one way or the other around whereby transmission of force safely be is taking place through the cross pin 5NT to the sidewalls of the notch TNG in the carrying stem, shaft or journal T. A friction bushing 5IFB made of suitable friction providing material arranged around the axis or shaft 5AKS is being pressed against this axis or shaft 5AKS by means of an adjustment screw 5IF which is seated in a side aperture in a fixed maintained standing external tube portion 5BY. By means hereof the turning movements of the axis or shaft 5AKS and thereby also of the turning movements of the stem, shaft or journal T are being counteracted, that is, the force being delivered through the turning providing transmission and through the sprocket 5TT apart from the necessary moment to provide the turning of the stem, shaft or journal T also has to provide a moment to overcome the friction provided by the screw means 5IF. In this manner an adjusting of the backlash of turning can be provided.

At the lower end of the carrying stem, shaft or journal T the presence of light emitting diodes and photo

transistors is being depicted which means for instance may serve the purpose sidewards to provide transmission of signals as already described above to be handled by a corresponding signal handling device SIG which is positioned on the bottom plate element 3B.

It can be remarked, that mechanically in practice for such a wheeled chassis comprising batteries able to provide 40 amperehours of aperation at a battery voltage of 24 volts and structurally incorporating an embodiment according to the invention as shown in the drawing may have a size so that the external belt or girdle 1YBAN arranged around the wheeled chassis has an external diameter of about .6 meter, and so that with a diameter of the ground-engaging wheels of .1 meter the upper edge of the external belt or girdle 1YBAN is being situated between .2 and .25 meter above the groundlevel. At such an embodiment the complete height of the wheeled chassis as from the ground up the level of the bushing carrying the carrying stem, shaft or journal T may in practice be arranged to be of the size of about .35 meter. A wheeled chassis which incorporate such dimensions definitely will have to be characterized as being in size well suited to be used for wheel chairs.

An advantageous electronic logic steering circuit to provide a safe steering of such a wheeled chassis being embodied according to the invention is described in further details as follows.

In case of a wheeled chassis of this kind which is carrying a seat a simple electronic steering in part of the rotation itself of the ground-engaging wheels in relation to the chassis and in part of the pivotal or turning position of the seat in relation to the chassis can be provided for instance by means of a simple turn button device arranged for each of these conditions of operation of the wheeled chassis, i.g. by means of three

on the steering panel arranged turn potentiometers having a midposition providing zero-activity, being equal to halt condition of the drive motor which is connected to the turn potentiometer, and when turned one or the other way around away from the midposition provides rotational activity of the drive motor with progressively increased activity, i.e. the velocity of the motor being increased, the more the potentiometer is being turned away from the midposition, e.g. providing a proportional increasing of the velocity dependent on the size of the turning angle of the potentiometer. A spring may be provided so that the spring draws the potentiometer back to midposition, i.e. to halt condition, when the turn button is released.

A very large number of embodiments of this kind of steerings are known being employable in practice together with all kind of drive motors, including non-electric drive motors, and the by way of example abovementioned type of steering is above sufficiently well described to enable any person skilled in the art to construct and provide such steering devices.

It has to be remarked, that either the described gear arrangements or the drive motors themselves can be of such per se known kind that in case of zero-activity, i.e. primarily when the mentioned midposition of the potentiometers is occupied, they are functioning as brakes, i.e. that the influences from external forces exerted on the wheeled chassis or on the seat do not result in a mechanically continued or in a mechanically reversed running operation of the drive device, but that such a braking force is provided either in that it itself is provided in the braking process or in that for its structure a suitable selection of in per se known electric, mechanic on friction based transmission members to be arranged between the drive motor and the driven elements in the wheeled chassis has been done so that a limiting of drive

force is achieved or in that a drive force deactivation or in part such drive force deactivation is selectable by the control means thus providing that the wheeled chassis and/or the seat in case of hitting objects in the environments or in case of another person helping a person seated in the seat a pushing and/or a turning of the wheeled chassis and/or the seat away from a currently occupied position is made possible to be achieved either in that a sufficiently large influence of force is exerted from outside or in that directly through manipulation from outside break of control is being provided.

Nevertheless, it may even be difficult in a simple manner for a handicapped person to operate these kind of potentiometers in a simple manner, also in the case, when in per se known manner through the insertion of added per se known microprocessor controls or through adding of per se known positional servo controls, such potentiometers completely or in part are arranged substituted by one, two, three or more push buttons.

On the other hand, according to the invention an as a unity structured electric/electronic steering control system serving to control all three of the mentioned drive motor operations is provided, permitting that a person seated in the seat is able to perform the operation single-handed, and even by means of one single finger, embodied in form of a so-called "joystick-control" and whereby supplementary a turn potentiometer of the above-mentioned type is included serving to control the turning drivemotor of the seat it is possible to provide a control system by which to-and-fro movements of joystick carried out in the longitudinal direction of the armrest, which armrest here thus is assumed to be arranged oriented in parallel with the forward-orientation of the seat, always will result in a driving of the ground-engaging wheels in this direction irrespective of performed turning-opera-

tions of the seat in relation to the wheeled chassis. This implies, that a movement of the joystick towards an object in the environments also results in a driving of the wheeled chassis in precisely that direction independent on the turning position of the seat.

A solution to attain this kind of control could according to the invention be contemplated to be attained in that the house of the joystick is held in position by a slave servo motor which counterturns the house without thereby necessarily also counterturning a possible scale of gradation slaved to a mutual turning possibly being performed between the seat and the wheeled chassis, i.e. in that a between the seat and the wheeled chassis coupled and according to the size of the turning angle based angle encoder in per se known manner delivers a servo signal to this slave servo motor performing a corresponding counteracting turning of the joystick house. The joystick, when being deflected in any selected direction, then only would have, thereby being determined by the angular deflection direction of the joystick in relation to the joystick house, to output an activating signal to the drivemotor of the device which is steering the ground-engaging wheels, and when the size of the deflection of the joystick away from the midposition thus has reached a predetermined minimum size then the drivemotor for the providing of rotation of the ground-engaging wheels becomes activated. When the deflection of the joystick is further increased the velocity of the rotation is increased, e.g. linear proportionally, or possibly exponentially or according to any other suitable function, so that in a suitable manner the velocity is increased dependent on the size of the deflectionof the joystick. Such kind of steering including electronic and mechanical devices to perform the steering is well known in a large number of varieties of embodiments according to the

technique of prior art.

According to the invention it is, on the other hand, made possible to omit a servo control involving the angular position of the joystick house in relation to the armrest, and furthermore, it is also advantageously and simplifying the angle encodings made possible to attain, that the deflectional sizes of the angle encoder signals are being reduced in a manner which is described in more details as follows.

According to the invention this is in practice, whereby all described angles are determined the same way round, being achieved in that an angle encoder is arranged between the wheeled chassis and the ground-engaging wheels outputting a signal dependent on the angular size of the current bearing of the drive direction of the ground-engaging wheels in relation to the wheeled chassis, and in that furthermore an angle encoder is arranged outputting a signal dependent on the angular position of the seat in relation to the wheeled chassis, and in that furthermore a steering panel is arranged outputting a signal angularly dependent on the relative direction of a wanted directional bearing of driving in relation to the seat or to any other object being for transportion carried by the carrying stem, shaft or journal on the chassis, and furthermore outputting a signal carrying information about the selected wanted drive velocity, and in that a device for handling these signals is provided which comprises signal adding and signal subtracting members so that, if it is not already being provided through any mutual mechanical relationship between the angle encoders, as for each individual angle encoder a difference signal in relation to an initial-encoder-signal is being provided, which initial-encoder-signal is issued when a common initial direction of orientation, i.e. bearing, of the seat as of the drive direction, i.e. bearing, of the wheeled chassis

is being occupied, and which thus angularly defined initial orientation as reference as follows are referred to as the common initial-orientation, and in that as from the two angle encoder signals a difference signal is provided being issued as the difference signal between the angle encoder output signal from the angle encoder arranged between the seat and the chassis and the angle encoder output signal from the angle encoder arranged between the chassis and the ground-engaging wheels, and in that the double of the sum of this difference signal plus the angular output signal from the steering panel is provided, and in that this thus double sum signal through a sine value hereof forming device as steering signal for the steering of the ground-engaging wheels in relation to the chassis is connected to the steering drive motor, and in that the thus not-doubled signal from the steering panel through a multiplying device is connected to the drive motor for the ground-engaging wheels as for serving to regulate the activation and the velocity of this drivemotor.

According to a further embodiment according to the invention at least one of these provided drive motor control signals is connected to the drive motor control circuit through a difference providing device reducing these signals with a small contribution, of which results that larger steering panel output signals have to be provided before an activation of the respective drive motor can take place.

As compared to the first mentioned embodiment according to the invention hereby a more simple control of chassis and seat is achieved involving fewer activations for performing turnings by means of the drive motors are required, as well as also a better adaptability of the drive and turning velocities to the steering operations performed by a person seated in the seat is being ex-

perienced. For instance, to achieve sidewards to and fro driving along the edge of a table, no other corrections of the drive orientations, i.e. of the general bearing, than small ones due to unavoidable human inaccuracies by handling when operating the steering panel will have to be called for, and thus large corrections of the drive orientation can be avoided, and this makes driving along the edge of a table with the wheel chair far more comfortably carried out than earlier. Also wear of floors and wear of carpets are being reduced by means of such a manner of steering because totally a lesser number of wheel movements are required.

An embodiment of the last mentioned kind being a further development of a steering arrangement for a wheel chair is described in further details and comprises a steering panel STY which e.g. is mounted on an armrest as illustrated in Fig. 9A. A further steering panel STYDRSD is illustrated being shown in Fig. 9A of simplification reasons. Nothing prevents that the two panels are combined to form one single panel.

At the left armrest of the seat a steering potentiometer SEATTURN of the above described firstmentioned type is illustrated comprising a turn button which from a forward directed midposition can be turned to one or the other side to produce a turning of the seat in relation to the wheeled chassis, ref. also Fig. 9A.

At the right armrest of the seat a steering panel with a joystick is illustrated and shown in more details in Fig. 9B. The joystick is by small or large deflections deflectable in any direction away from a here vertical midposition. During deflection an output signal H is generated having an amplitude dependent on the size of the current deflection, e.g. linearly proportionally dependent, being for instance H = E * JOYSTICKDEFLECTION, and being for instance H = E or H = E * a suitable factor

at full deflection. Dependent on the selected direction of deflection in relation to the armrest, here referred to through the angle φ , two sets of output terminals from the joystick yield partly a signal $X = E * \cos(\varphi)$ and partly a signal $Y = E * \sin(\varphi)$, whereby E, as follows, can be regarded as either a common operating supply voltage of or as a reference voltage within the circuits.

As to be understood of Fig. 9 it is contemplated that, e.g. when manufacturing the wheel chair or at a later time when adjustments are being carried out, a direction "0" is provided as a said common initial-orientation as bearing for in part the driving of the wheeled chassis and in part for the direction of orientation of the seat. At a given moment the ground-engaging wheels thus will be turned an angle ψ away from the said common initial-direction "0". As follows a situation is described by which such an angle has the size ψ , from which current position a new drive orientation of the ground-engaging wheels is wanted established. The angle ψ A is then the angle from which a turning to a new angle ψ B is wanted to be provided, but the existing angle between the seat and the wheeled chassis is not wanted changed. The seat direction in itself thus follows the wheeled chassis, but, when the angle encoders were set to zero, both angles ψ and φ were equal to zero, thus the drive orientation "0" and the seat orientation "0" were mutually the same and thus both pointed in that direction.

As mounted between the seat and the wheeled chassis angle encoders of a great variety of kinds may be employed, of which many fully are able to provide the same results as the angle encoders being contemplated while describing the invention and whereby the here made choice just has to be regarded as a more or less casual one.

In Fig. 8 of the drawing the structural principle of an angle encoder of the double slide arm type is shown

being shown as comprising two such rotary slidable arms which are arranged 90° mutually spaced, and when the supplied voltages are +E and -E then dependent on the turning angle γ POT two signals are going to be yielded: E * sin (γ POT) and E * cos (γ POT), i.e. they thus function together as a sine-cosine-potentiometer being referred to in the following as SIN/COS/POT. These angle encoders are easily mounted in place so that the pointing direction of the arms towards the right zero-terminal corresponds to the described said common initial-direction of the seat and of the wheeled chassis in relation to the drive direction, i.e. the bearing direction, of the ground-engaging wheels.

When contemplating the condition illustrated through Fig. 9 an electronic circuit is as follows described in further details and according to the invention it produces the aforementioned summation and difference operations whereby it should be remembered that the circuit as nett result has to provide an angular signal thus comprised of:

$\Theta + \varphi - \psi$ A

In Fig. 10 of the drawing such a circuit is illustrated. The left hand portion illustrates three signal providing elements: The joystick JOYST and the two said sine/cosine/potentiometers SIN/COS/POT. The signals they provide are illustrated by means of the wire connections being shown above them. It is furthermore contemplated, that JOYST yields a generally fixed signal which correspond to the signal H from JOYST when the joystick is deflected just a little bit away from the midposition, but which deflection on the first hand is too small to provide a sufficiently precise determination of the direction and on the other hand has to be regarded as being so small so that it accidently might have been incurred from outside and therefore should not result in any moving of the wheelchair. A difference providing device HDIF provides

such a corrected velocity determining signal.

By means of eight multiplying devices which can be of the analog-signal-multiplying type of devices, such as of digitized kind, and two summation providing devices and two difference providing devices two signals are yielded, which can described respectively as:

$E * \sin(\psi B - \psi A)$ and

$e * \cos(\psi B - \psi A)$

in Fig. 10 of the drawing. The lastmentioned hereof is, partly through a multiplying device to which also the arriving velocity signal HDIF is connected the size of which being determined by the size of the deflection of the joystick JOYST and partly through a switching device, connected able to activate the drive motor which brings the ground-engaging wheels to rotate. By means of the value of the signal from the switching device the velocity and the running of the ground-engaging wheels are being determined, whereby the sign of the voltage of this signal determines the direction of rotation of these wheel, i.e. either the one or the other way around. On the other hand, the ground-engaging wheels should not be brought to rotate before the direction, i.e. the bearing direction, of these wheels has been sufficiently accurately adjusted. To this purpose the illustrated HALT-AT-TURN DRIVE-HALT-SIGNAL is used in that it controls the opening and closing of the switching device.

The two abovementioned produced signals are connected to one further multiplying device and through a multiplying device which only serves to multiply the signal with the factor 2. The illustrated TURN ANGLE SIGNAL is hereby provided, and it is connected to the steering drive motor for the steering of the drive direction, i.e. of the bearing direction, of the ground-engaging wheels. This angle turn signal thus has a value:

$E * \sin(2 * (\psi B - \psi A))$.

The first of the hereto employed two lastmentioned produced signals is used as illustrated at the upper right hand corner of Fig. 10 of the drawing as the aforementioned HALT-AT-TURN DRIVE-HALT-SIGNAL which first is passed through a device which removes possible changes of sign and furthermore subtracts a threshold value referred to as E MIN.DIR.ATT., so that a certain joystick deflection first has to be present before the drive direction, i.e. the bearing direction, of the ground-engaging wheels is altered. In this manner the carrying-out of unnecessary small-corrections of this drive direction are avoided.

To a high extend, the described circuit provides the advantages which are achievable as mentioned by means of the invention.

In Fig. 11 of the drawing a possible manner of placing the two angle encoders on the wheeled chassis is shown when the encoders by way of example are of the type which is illustrated in Fig. 8 being provided with a direct on the slidable potentiometer arms arranged driving wheel, and when the wheeled chassis is shaped as by way of example illustrated in Fig. 4 of the drawing.

When this driving wheel arranged on the angle coders which encoders in Fig. 11 are referred to as VSMS and VSMT is a sprocket then the angle encoders VSMS and VSMT by way of example may be positioned so that each sprocket is engaging into a chain respectively the chain MSK and the chain MTK. To achieve that the angle encoders provide correct output signals the diameter of the sprockets e.g. may be shaped as to be equal to the diameter of the sprockets STT and 5TT which are positioned as driving sprockets partly on the mechanism which is steering the direction, i.e. the bearing direction, of the ground engaging wheels and partly on the turnable stem, shaft or journal carrying the seat. The angle encoders are when being mounted being so turned in position that they engage into the chains MSK and MTK in such a manner that the

angle signal "0" is attained when the mechanism they control is being adjusted to occupy the said common initial-direction for the seat and for the ground-engaging wheels.

By means of the described steering device a safe and precise functioning steering is achieved also when very fast acceleration and deceleration times for the driving are wanted attained. To achieve this it may be wanted that an adjustability of the acceleration and deceleration times is provided for so that they can be kept within suitable limits. An advantageous embodiment according to the invention serving this purpose is characterized in that the steering device is connected to a device which, when changes of the steering values are introduced, delays these changes as a function of the time, and whereby the size of this time delay furthermore may be dependent on the size of the signal connected to this device, i.e. being a time delay, which furthermore is dependent on the amplitude of the steering signal connected to the device respectively of the control signals which are applied to the device.

Such a device which is connected with the steering device can for instance be included in the output from the difference providing device HDIF illustrated in Fig. 10. Herethrough, it is achieved that the wheeled chassis is not accelerating too fast when been moved, and if the time delay furthermore is made dependent on the amplitude it is easily achieved that the acceleration may be made small at small velocities and be made large or somewhat larger when the velocity is a little larger than just a very low velocity and is limited to not being too large at comparatively high velocities and somewhat the same being the case, but possibly through choice of other sizes of time delays, at decelerations although depending on the manner of employing the wheeled chassis. The time delays may possibly be made stepwise changeable by means of switching members which then may be arranged for the purpose.

C L A I M S

1. A wheeled chassis (1) including a drive device for driving the wheels, and which wheeled chassis may serve as chassis for a wheelchair or as a wheeled chassis for the transporting of some other object, the wheeled chassis having at least one of the wheels driven by the drive device through an intermediary drive transmission, and whereby at least one of the wheels for the steering of the driving course of the chassis is mounted to the chassis through a steerable support being steerable by means of at least one, to the steerable support connected, steering motor which steering motor receives steering signals from a steering panel with steering control devices, and whereby the wheeled chassis further comprises support means adapted to support a chair or other holding means adapted for the fixation and holding of the said objects to be transported c h a r a c t e r i z e d in t h a t, all steerable wheels (2R) also are by means of the drive device driven ground-engaging wheels, whereby these, thus driven ground-engaging wheels (2R) are mounted steerably suspended each being pivotal about a vertical steering axis (2S) geometrically maintained within or in the near vicinity of a vertical plane comprising the respective wheel (2R) axis (2RAKS), and in that by means of a between the steering axes (2S) arranged and these (2S) mechanically connecting steering transmission system (STT, MSK) including a, through this steering transmission system, for the pivoting of these said steering axes (2S) connected steering driving device (MS) simultaneously and through the same direction of rotation each steering axis (2S) is arranged able to pivot all these driven ground-engaging wheels (2R) about their steering axes (2S), i.e. through approximately mainly equally sized pivoting angles, and in that a with the driven ground-engaging

wheels (2R) directly connected, or through a drive transmission system (RTT, MRK) connected, drive device (MR) simultaneously through equal units of time in the same direction of rotation rotates all these driven ground-engaging wheels (2R) with mainly equally sized angles of rotation about their wheel axes (2RAKS).

2. Wheeled chassis according to claim 1 c h a r a c t e r i z e d i n t h a t , the steering axis (2S) comprises two coaxially arranged axes or shafts (RTAKS, STAKS) of which the coaxially innermost (RTAKS) at the lower end terminates in a toothwheel (RTPI), in particular a conically shaped toothwheel of a bevelgear, engaging into an as corresponding conically tootwheel (2RKRO) shaped and/or into a with engaging teeth provided ground-engaging wheel (2R) whereby the wheel axis (2RAKS) hereof geometrically together with the ground form an angle of a size deviating from zero degree and preferably is laying between 10 and 30 degrees, and whereby the wheel axis (2RAKS) is bearing suspended in a bearing block being in a fixed manner connected with the coaxially outermost of the steering axes (2S), and whereby the upper end of the two coaxially steering axes or shafts (STAKS) respectively are connected with the drive transmission system (RTT, MRK) and with the steering transmission system (STT, MSK) which respectively provide drive connections with on the one hand the driving drive device (MR) and on the other hand the steering drive device (MS), and whereby each individual ground-engaging wheel (2R) and each individual bearing block (2B) preferably both can be semi-spherically shaped and arranged with their flat surfaces facing each other, and whereby between them for the keeping-away of dust and/or dirt an annular sealing means is provided inserted between such two semi-spherically shaped bodies (2R, 2B).

3. Wheeled chassis according to claim 1 or 2 c h a -

r a c t e r i z e d i n t h a t , the steering axes (2S) of the individual ground-engaging wheels (2R) are arranged bearing suspended in at least one elastomeric, in particular a springlike elastomeric, plate member (1PA) and/or in more of such kind (1PA) which thus interconnect the bearings (1PSA, 1PSB) for said steering axes (2S).

4. Wheeled chassis according to claim 1, 2 or 3 c h a r a c t e r i z e d i n t h a t , elements such as batteries (BATT), electric devices, namely such as charging device (LADE) for batteries, as well as electric and electronic equipment (ELEK), namely such as electronic steering panels, contactors and other switching members, it is according to the invention preferred that such members are arranged as being mounted on a plateshaped bottom element (3B) which has a diameter being of approximately the same size as the diameter, or a little less than this, between opposite positioned ground-engaging wheels (2R) mounted on the wheeled chassis, and that the bottom plate element (3B) in radial direction at the periphery is arranged to have a slanting upwards running peripheral rim, and that the bottom plate element easy-to-fasten by means of easy accessible holding members of per se known kind, such as screws, snaplock-devices, tounged locking mechanisms, etc., is kept in place on the wheeled chassis (1).

5. Wheeled chassis according to claim 1, 2, 3 or 4 c h a r a c t e r i z e d i n t h a t , the upper portion of the wheeled chassis may be covered by means of at least one single element shaped as a broad annular top cover (1Y) having a peripheral portion (1YL) which is cylindrically shaped and downwards terminates in a skirt shaped portion having the external surface thereof arranged as or being comprised as a broad belt or girdle (1YBAN) exhibiting suitable elastomeric properties against

blows or strokes from external objects, being of a material such as soft rubber or any other kind of elastomeric plastic material, and whereby the top cover (1Y, 1YL) by means of suitable fastening or holding means of any per se known kind, such as screws, snap-locking mechanisms, tounged locking mechanisms, etc., in an easy-to-dismantle manner is kept in position on the wheeled chassis (1).

6. Wheeled chassis according to claim 1, 2, 3, 4 or 5 characterized in that, at least two simple, rigid and radially oriented connecting struts (1A) which provide a mechanically rigid connection between a centrally supporting member (5), which serves to support a wheelchair seat or serves to support any other object to be transported by means of the wheeled chassis (1), and at least one of the aforementioned peripheral elastomeric plate elements (1PA) which belong to the wheeled chassis (1), and whereby these connecting struts (1A) comprise fastening means or fastening apertures for the fastening of at least one, preferably for the fastening of two vertically spaced arranged, device-supporting plate member(s) (4MA, 4MB) arranged to support the driving and steering drive means (MR, MS, MT), and whereby preferably between these two said drive means drive and steering transmissions (MRK, MSK) are arranged, thus connecting the driving and steering drive devices (MR, MS) and the suspensions (2S, 2B) for the ground-engaging wheels (2R).

7. Wheeled chassis according to claim 1, 2, 3, 4, 5 or 6 characterized in that, a vertical arranged bushing bearing (5) able to serve as bearing for a vertical stem, shaft or journal (T) belonging to a by means of a further drive device (MT) pivotal arranged seat (S) or fastening or holding member for any other said object to be transported by the wheeled chassis (1), apart from a further comprised drive trans-

mission (MTK) providing drive connection (MT) hereto, is provided with a, preferably adjustable, intermediary frictional element (5IFB) arranged between the bushing bearing (5BY) and the said stem, shaft or journal (T), whereby this frictional element (5IFB) possibly can be provided as a from the outside adjustable, suitable elastomeric screw means (5IF) made as of nylon material or other plastic material or elastomeric material.

8. Steering system for steering drive means and direction steering means in a wheeled chassis as according to claim 1, 2, 3, 4, 5, 6 or 7 characterized in that, to provide drive velocity regulation and/or to provide a fully correlated maintaining of the turning position of the seat as unaltered in relation to the environments independent on the current through steering acquired direction (i.e. bearing) of driving for the wheeled chassis as also to provide the possibility of maintaining the turning direction of the seat as to be correlated with the current through steering provided direction, i.e. bearing, of driving for the wheeled chassis, and whereby all described angles are determined the same way round, being achieved in that an angle encoder (VSMS) is arranged between the wheeled chassis (1) and the ground-engaging wheels (2R) outputting a signal dependent on the angular size of the current bearing of the drive direction of the ground-engaging wheels (2R) in relation to the wheeled chassis (1), and in that furthermore an angle encoder (VSMT) is arranged outputting a signal dependent on the angular position of the seat (S) in relation to the wheeled chassis (1), and in that furthermore a steering panel (STY; STYDRSD) is arranged outputting a signal angularly dependent on the relative direction of a wanted directional bearing of driving in relation to the seat (S) or to any other object being for transportion carried by the carrying stem, shaft or

journal (T) on the chassis (1), and furthermore outputting a signal carrying information about the selected wanted drive velocity, and in that a device for handling these signals is provided which comprises signal adding and signal subtracting members (Fig. 10) so that, if it is not already being provided through any mutual mechanical relationship between the angle encoders, as for each individual angle encoder a difference signal in relation to an initial-encoder-signal is being provided, which initial-encoder-signal is issued when a common initial direction of orientation, i.e. bearing, of the seat (S) as of the drive direction, i.e. bearing, of the wheeled chassis (1) is being occupied, and which thus angularly defined initial orientation as reference as follows are referred to as the common initial-orientation, and in that as from the two angle encoder signals a difference signal is provided being issued as the difference signal between the angle encoder output signal from the angle encoder arranged between the seat (S) and the chassis (1) and the angle encoder output signal from the angle encoder arranged between the chassis (1) and the ground-engaging wheels, and in that the double of the sum of this difference signal plus the angular output signal from the steering panel (STY; STYDRSD) is provided, and in that this thus double sum signal through a sine value hereof forming device as steering signal for the steering of the ground-engaging wheels (2R) in relation to the chassis (1) is connected to the steering drive motor (MS), and in that the thus not-doubled signal from the steering panel through a multiplying device is connected to the drive motor (MR) for the ground-engaging wheels (2R) as for serving to regulate the activation and the velocity of this drivemotor (MR).

9. Steering system according to claim 8 characterized in that, in the steering

system at least one of these provided drive motor control signals is connected to the drive motor control circuit through a difference providing device reducing these signals with a small contribution, of which results that larger steering panel output signals have to be provided before an activation of the respective drive motor can take place.

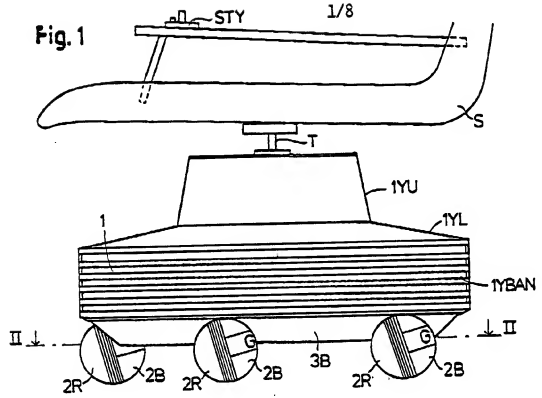
10. Steering system according to claim 8 or 9 characterized in that, in the steering system a device is comprised which, when changes of the steering values are introduced, delays these changes as a function of the time, and whereby the size of this time delay furthermore may be dependent on the size of the signal connected to this device, i.e. being a time delay, which furthermore is dependent on the amplitude of the steering signal connected to the device respectively of the control signals which are applied to the device.

ANY REFERENCE TO

FIGURE 11

SHALL BE CONSIDERED NON-EXISTENT

Fig. 1


STY
S
T
1YU
1
1YL
1YBAN
II
II
G
G
3B
2R
2B
2R
2B
2R
2B

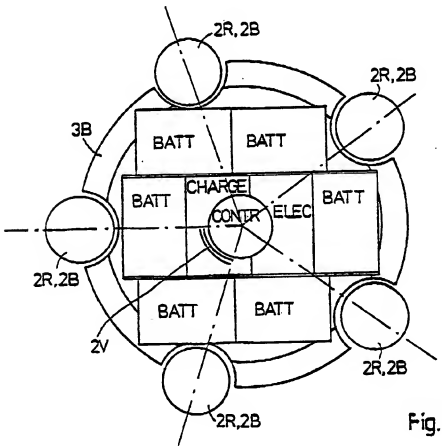

2R,2B
2R,2B
3B
BATT
BATT
BATT
CHARGE
CONTR
ELEC
BATT
2R,2B
BATT
BATT
2V
2R,2B
2R,2B

Fig. 2

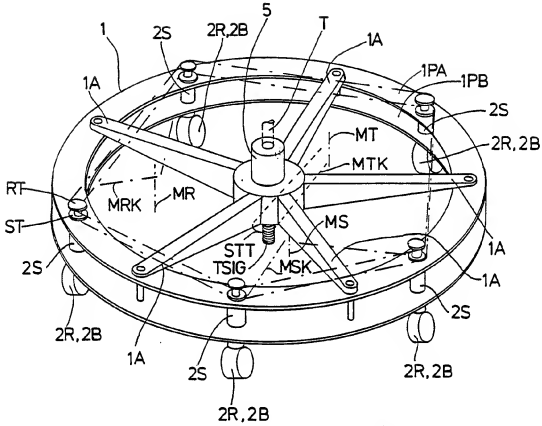


Fig. 3

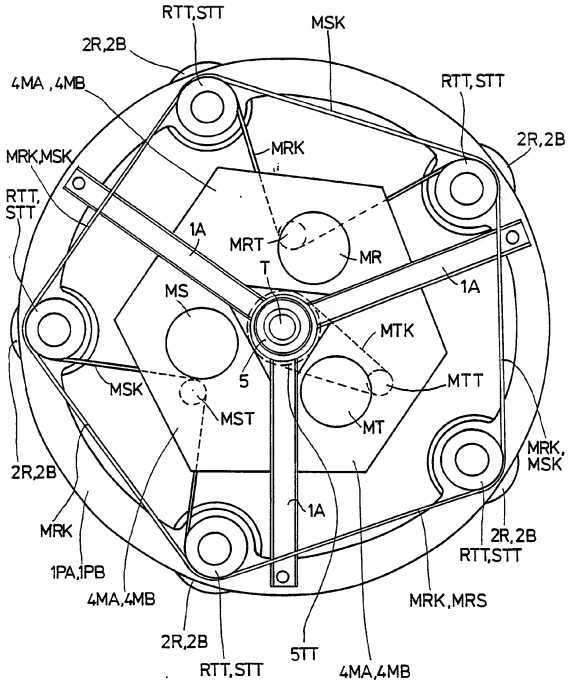


Fig. 4

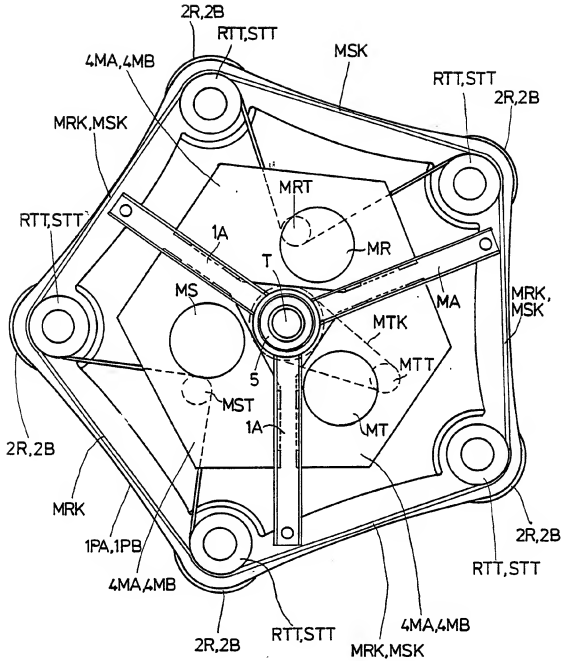


Fig.5

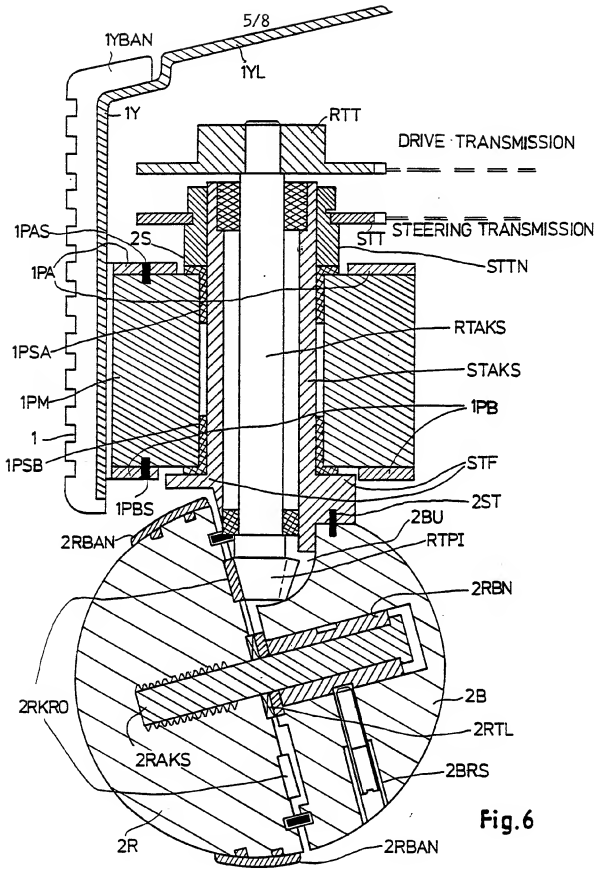

5/8
1YBAN
1YL
1Y
RTT
DRIVE TRANSMISSION
1PAS
2S
STT
STEERING TRANSMISSION
STTN
1PA
RTAKS
1PSA
STAKS
1PM
1PB
1
1PSB
STF
2ST
1PBS
2BU
2RBAN
RTPI
2RBN
2B
2RKRO
2RTL
2RAKS
2BRS
2R
2RBAN

Fig.6

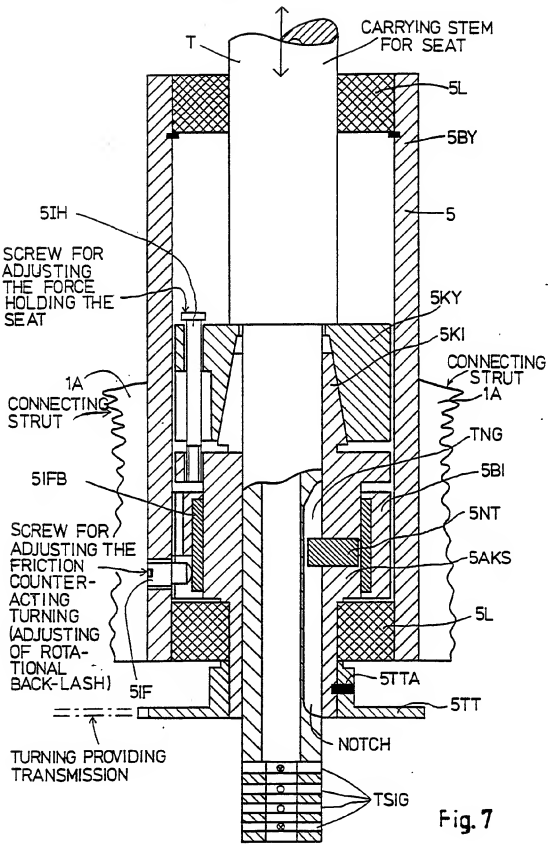

T
CARRYING STEM FOR SEAT
5L
5BY
5
5IH
SCREW FOR ADJUSTING THE FORCE HOLDING THE SEAT
5KY
5KI
CONNECTING STRUT
1A
1A
CONNECTING STRUT
TNG
5BI
5IFB
5NT
SCREW FOR ADJUSTING THE FRICTION COUNTER-ACTING TURNING (ADJUSTING OF ROTA-TIONAL BACK-LASH)
5AKS
5L
5IF
5TTA
5TT
NOTCH
TURNING PROVIDING TRANSMISSION
TSIG

Fig. 7

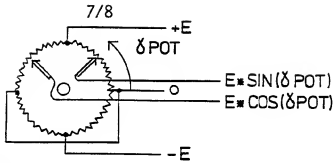

+E
δ POT
E* SIN(δ POT)
E* COS(δPOT)
-E

Fig.8

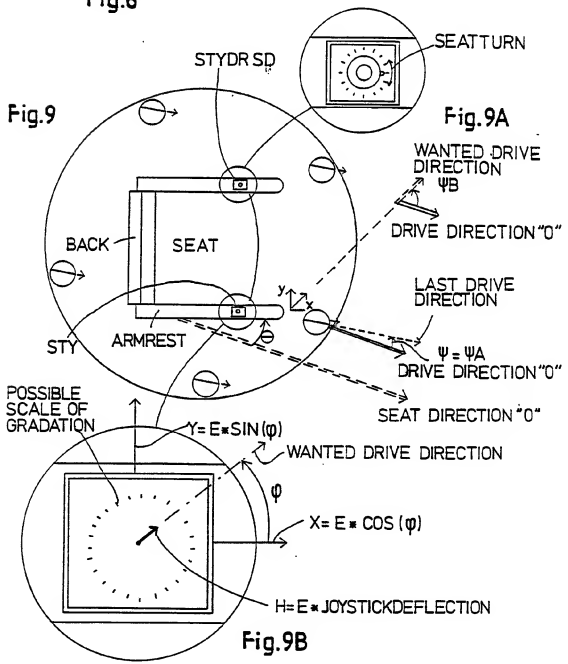

SEAT TURN
STYDR SD
Fig.9
Fig.9A
WANTED DRIVE DIRECTION
ψB
DRIVE DIRECTION "0"
BACK
SEAT
LAST DRIVE DIRECTION
STY
ARMREST
ψ = ψA
DRIVE DIRECTION "0"
SEAT DIRECTION "0"
POSSIBLE SCALE OF GRADATION
Y= E*SIN(φ)
WANTED DRIVE DIRECTION
φ
X= E* COS (φ)
H= E* JOYSTICKDEFLECTION

Fig.9B

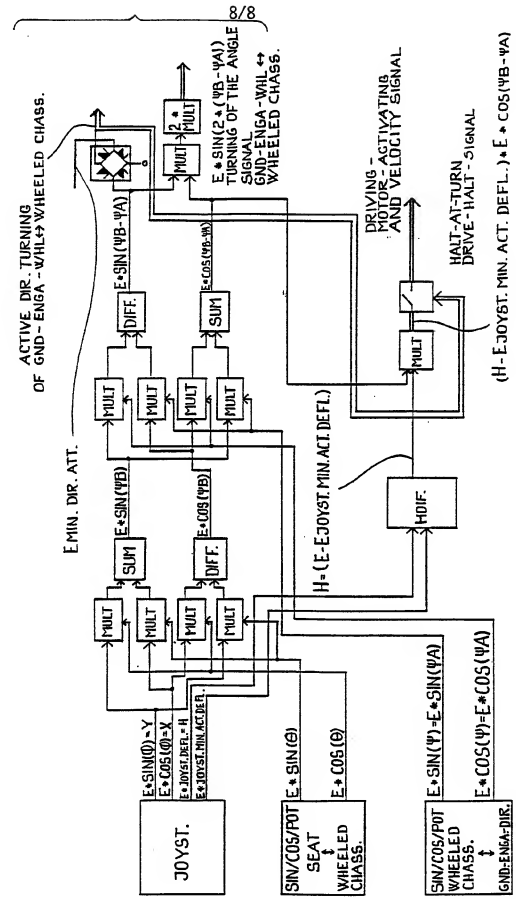

ACTIVE DIR. TURNING OF GND-ENGA-W/HL↔WHEELED CHASS.
E·MIN. DIR. ATT.
E·SIN(ΨB-ΨA)
E·SIN(2·(ΨB-ΨA)) TURNING OF THE ANGLE SIGNAL GND-ENGA-WHL↔ WHEELED CHASS.
E·COS(ΨB-ΨA)
DRIVING-MOTOR ACTIVATING AND VELOCITY SIGNAL
HALT-AT-TURN DRIVE-HALT-SIGNAL
(H-EJOYST. MIN. ACT. DEFL.)·E·COS(ΨB-ΨA)
H=(E-EJOYST. MIN. ACT. DEFL.)
E·SIN(Θ)=Y
E·COS(Θ)=X
EJOYST. DEF.=H
EJOYST. MIN. ACT. DEF.
JOYST.
E·SIN(Θ)
E·COS(Θ)
SIN/COS/POT SEAT↔WHEELED CHASS.
E·SIN(Ψ)=E·SIN(ΨA)
E·COS(Ψ)=E·COS(ΨA)
SIN/COS/POT WHEELED CHASS.↔GND-ENGA-DIR.
MULT
SUM
DIFF.
HDIF.
2·

FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 93/00129

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: A61G 5/04, A47C 9/00 // A47C 15/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: A61G, A47C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP, A1, 0026098 (MACKINTOSH, CHARLES), 1 April 1981 (01.04.81)	1-6
A		7-10
	--	
X	US, A, 4463821 (FALAMAK), 7 August 1984 (07.08.84)	1-6
A		7-10
	--	
X	US, A, 4683973 (HONJO ET AL), 4 August 1987 (04.08.87)	1
A		2-10
	--	

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 July 1993	09 -07- 1993
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Nils Ekström Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 93/00129

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO, A1, 9118577 (BOUND, KEITH, RICHARD), 12 December 1991 (12.12.91) ---	1-10
A	GB, A, 2184988 (JEREMY JOSEPH FRY), 8 July 1987 (08.07.87) ---	1-10

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INTERNATIONAL SEARCH REPORT
Information on patent family members

28/05/93

International application No.
PCT/DK 93/00129

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A1- 0026098	01/04/81	SE-T3-	0026098	
		AT-T-	4021	15/07/83
		CA-A-	1147250	31/05/83
		JP-C-	1400804	28/09/87
		JP-A-	56045656	25/04/81
		JP-B-	62007860	19/02/87
		US-A-	4274503	23/06/81
US-A- 4463821	07/08/84	CA-A-	1193553	17/09/85
		DE-A-	3307191	08/09/83
		FR-A-	2522299	02/09/83
		GB-A,B-	2116131	21/09/83
		JP-C-	1643790	28/02/92
		JP-B-	3001169	09/01/91
		JP-A-	58199225	19/11/83
		US-A-	4533998	06/08/85
US-A- 4683973	04/08/87	JP-B-	4053730	27/08/92
		JP-A-	61235220	20/10/86
		US-A-	4717812	05/01/88
WO-A1- 9118577	12/12/91	AU-A-	7953891	31/12/91
		GB-A-	2244684	11/12/91
GB-A- 2184988	08/07/87	US-A-	4852679	01/08/89